problems to which they continue to give rise. The recent enfranchisement of large numbers of women lends additional impetus to the demand for means of more extended facilities of adult education, which is, after all, to be regarded as essential for men and women alike, however great may be the development in the education of children and adolescents.

An interesting review is given of the present facilities of adult education as exemplified in the University Extension system, that of the Adult Sunday School, the Workers' Educational Association, Ruskin College, the Working Men's Colleges, and other bodies, including the work of the local education authorities, but the conclusion is rapidly reached that so long as the present economic conditions prevail these and other means of educational progress must remain short of their full harvest, and the nation be left vastly poorer thereby. The evil conditions which beset the worker and hinder his full educational and social development are the subject of careful review. They are found in the abnormal length of the working-day in most industries. in the heavy and exhausting work in others, in the demands of excessive overtime, in the shift system and that of "split turns," in night-work, continuous or periodic, in the evil effects of continuous, monotonous labour, and, finally, in the insecurity of employment which besets many workers in industrial and rural occupations.

Proposals are made to shorten by law the working-day, so that it shall not exceed, with some qualifications, eight hours in any industry; that in heavy, exhausting kinds of work the legal working-day shall be shorter than the normal, and, where possible, mechanical devices introduced, such occupations to be specially regulated; that overtime and "shift-work" shall be the subject of legal regulation and reduced to a minimum; and that regular night-work shall be prohibited, whether periodic or continuous, except where it is absolutely necessary. With the view of meeting the evils of continuous, monotonous labour, alternating forms of employment are suggested, and the establishment of works committees for the consideration of matters affecting workshop life. Measures should also be taken to minimise the ruinous effects of unemployment by the reorganisation of industry or the extension of the principle of insurance. Other measures of reform are also suggested with respect to schemes of housing and town-planning, in order to secure better domestic conditions and pleasanter surroundings for the worker, and there should be established in every village an institute or hall under public control. An eloquent testimony is offered at the conclusion of the report to the splendid qualities and potentialities latent in our people, as shown by their sacrifices in the present disastrous war, which render them worthy of any effort to improve and make worthy their conditions of life.

The suggestions in the report are made by men and women experienced not only in education, but also in the actual conditions of industrial life, and may be commended to the earnest consideration of all who are responsible for the future well-being of the nation. They are the pre-conditions of any form of effective adult education.

A MONOGRAPH ON COW-WHEAT.

M. G. BEAUVERD'S "Monographie du genre Melampyrum," which has recently appeared (*Mémoires de la Société de Physique et d'Histoire naturelle de Genève*, vol. xxxviii., fascicule 6), is an intensive study of a genus carried out under the serious limitations imposed by the present war conditions. Melampyrum, the British cow-wheat, which is represented in our flora by four species, is one of a small group of genera of the family Scrophulariaceæ, which are characterised by a hemiparasitic habit. They are small herbaceous plants which draw part of their nourishment from other plants, to the roots of which they become attached by suckers developed upon their own roots. Many of them have the peculiarity of turning black on drying.

The genus, fourteen species of which are recognised by M. Beauverd, is widely distributed in the northern hemisphere. There are four areas of distribution: a North American, extending right across the continent; an Eurasiatic, comprising the greater part of Europe with Central Asia; an eastern Mediterranean area; and a Far East or Chinese and Japanese area. M. Beauverd's work, so far as the systematic study of the species is concerned, is very largely based on the material in the various public and private Swiss collections, which, though rich in a representation of Central European forms, would naturally contain a less extensive series from other areas. His knowledge of British forms is derived almost exclusively from Mr. G. C. Druce's collection, which he has had the opportunity of studying. The author has not consulted the great British and Russian herbaria, apart from which the study of the central and eastern Asiatic forms must be far from complete. Further, in the systematic study of a genus it is of importance to examine the original specimens on which previously described species and varieties are based, and a large proportion of these are to be found only outside the circumscribed area of M. Beauverd's studies. The limitations under which the work has been carried out must, therefore, necessarily lead to a want of balance between the treatment of the Central European forms and of those occurring outside that area and to a lack of completeness in the systematic scheme.

Within the limits imposed M. Beauverd has made good use of the material available. He has studied in the field the range of variation of species and forms, and by a careful microscopic study of the details of the flower, the technique of which he describes at some length, he has convinced himself of the relative value of fixed qualitative and variable quantitative characters in the discrimination of species and of inferior grades of relationship. Thus M. Beauverd regards the two different methods of dehiscence of the fruit, to which he had previously directed attention, as affording criteria for the two main divisions of the genus. The author has also noted in some species the presence of a ring of hairs on the inside of the corolla-tube above the base, in such a position as to protect the nectar beneath it from being pillaged by an insect biting through the lower part of the tube; the presence or absence of this "nectarostegium," the minute structure of the hairs associated with the anthers or occurring elsewhere in the flower, and the form of the bracts at the top of the inflorescence, afford constant characters for the differentiation of sections or aid in the diagnosis of the species.

On the other hand, variable quantitative characters such as the number of joints in hairs of the same plan of structure, the relative size of flowers or leaves, the number of sterile bracts or of stem-nodes between the root and the inflorescence, the size and frequency of the marginal teeth of the bracts, the size of the calyx-teeth, and the degree of opening of the mouth of the corolla, are of value in assigning limits to subspecies and varieties. The author's discussion of these points and their application in the systematic scheme adopted by him afford the most interesting chapter in the memoir.

Apart from its value as a contribution to the systematic study of the genus, the monograph supplies a useful *résumé* of previous work. The first chapter,

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occupying fifty pages, is a chronological précis of this nature. The morphology of the vegetative or reproductive organs is treated in detail in another chapter, while a chapter entitled "Biological Notes" deals with pollination, the distribution of the seeds by the aid of ants, and some ecological notes based on the author's own observations.

LACUSTRINE FAUNA IN THE FAR EAST.[1]

THE two memoirs before us contain the first five of a series of reports upon material collected, for purposes of comparison with a corresponding ecology in the Indian fauna, by Dr. Annandale in certain lakes of the Far East, namely, in Lake Biwa in Japan, in Tai Hu Lake in the Yangtse Delta, and in Talé Sap, a lagoon on the eastern coast of the Malay Peninsula; with them is incorporated a short critical dissertation on Oriental Batrachia in general.

Lake Biwa, with an area of 269 square miles, lies among hills about forty miles distant from the sea; as it is more than 200 ft. deep in many parts and reaches a depth of 320 ft. in some places, and as there is considerable difference in summer temperature between the open surface and the depths, there is some variety in its biological conditions. Tai Hu, about sixty miles in length and in breadth, is a muddy lake of uniform conditions, nowhere exceeding 12 ft. in depth; though it is forty miles from the sea and its water is quite fresh, its fauna contains a distinct marine or estuarine element. Talé Sap differs from the other two lakes in lying on the seaboard and having a narrow sea-inlet; like the Chilka Lake in Orissa, it consists of two distinct basins of unequal density—though the inner basin is fresh, or practically so, throughout the year—and so presents variable conditions; the greatest depth of the main fresh-water portion is about 16 ft.

The collections described in the present instalments are the Polyzoa in part (Entoprocta and Ctenosomatous Ectoprocta), the Mollusca of Lake Biwa, and the Hydrozoa and Ctenophora, all by Dr. Annandale himself, the aquatic Oligochæta by Col. J. Stephenson, I.M.S., and the aquatic Hemiptera by Mr. C. A. Paiva. Most of the reports are distinguished by attention to anatomical details and to biological interpretations of fact.

The Polyzoa comprise five species from Talé Sap and two from Tai Hu. Two of them (*Triticella pedicellata* and *Paludicella elongata*) have not before been recorded from tropical latitudes. A third noteworthy form, closely akin to Loxosomatides, but differing in the arrangement of the muscles of the stalk, is distinguished as a new genus, Chitaspis.

The Mollusca of Lake Biwa include twenty-nine species, of which eleven are restricted to this lake and eleven others are peculiar to Japan. Most of the genera (*e.g.* Limnæa, Planorbis, Vivipara, Bithynia) are cosmopolitan, or (*e.g.* Anodonta, Valvata) palæarctic, or, like Melania and Corbicula, of common occurrence in tropical and subtropical latitudes. The author distinguishes a rupicolous community of species quite distinct from that inhabiting the mud and sand in shallow water, and a congeries of species restricted to the depths, among the latter being the only representatives of Pisidium and Valvata occurring in the lake.

Among the Hydrozoa identified are *Cordylophora lacustris*, from Tai Hu, and five species from the brackish parts of Talé Sap. A description of a new genus of Hydromedusæ, Asenathia, from the Gangetic Delta, is also included; this the author suspects to be the sexual generation of the curious hydroid Annulella recently described by Ritchie from that part of Bengal.

Among the aquatic Oligochæta, *Branchiura sowerbyi* and *Limnodrilus socialis* were found in association here as in India; a new species of Chætogaster commensal in sponges is described, and a new genus Kawamuria—a Branchiura without gills and having the penis-sac provided with a penis—from the depths of Lake Biwa. Col. Stephenson also describes a new species of Criodrilus, found at the remarkable depth of 180 ft. in this lake.

The aquatic Hemiptera are for the most part common Oriental forms; but *Microvelia sexualis*, from Talé Sap, is a new species of Hydrometrid representing a genus hitherto known only from North America.

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[1] "Zoological Results of a Tour in the Far East." Edited by Dr. N. Annandale. Memoirs of the Asiatic Society of Bengal, vol. vi., pp. 1–74 and pp. 75–155.

CARBONISATION REACTIONS.[1]

IT is difficult to obtain clear information about the reactions in carbonisation by the direct distillation of coal in the laboratory, especially about minor, though important, products such as toluene, benzene, etc., of which the quantities available become excessively small. Therefore the author, in conjunction with Dr. S. F. Dufton, chose to investigate the stability of individual compounds in different atmospheres when passed over heated coke, with a time of contact of the same order as met with in carbonising practice. The behaviour of the compounds was dependent on conditions of temperature and concentration, apparently in accordance with the laws of chemical dynamics. Benzene, at varying partial pressures in an atmosphere of nitrogen, which was assumed to be inert, showed signs of incipient decomposition at 550° C., leading to the production of diphenyl. At higher temperatures this was more extensive, and *p*-diphenylbenzene also appeared. The former condensation at least is reversible. Benzene in an atmosphere of hydrogen yielded much less diphenyl under otherwise similar conditions, and at 800° C. is scarcely decomposed at a concentration of 5 per cent. by volume, while diphenyl in an atmosphere of hydrogen is reduced to benzene. This doubtless accounts for the practical non-occurrence of diphenyl in coal-tar, although this substance is readily formed from benzene in the absence of hydrogen. Benzene did not yield naphthalene or unsaturated compounds. At 900° C., even in hydrogen, benzene was extensively broken down with the formation of carbon. Toluene in nitrogen shows signs of decomposition at 550° C., but there are now two possibilities—reactions through the nucleus and also through the side chain. The product is more complex, a solid being formed, which was identified as stilbene $(CH.C_6H_5)_2$, and also an oil. At 750° C. decomposition was more extensive, naphthalene and anthracene being identified among a number of other products. On substituting hydrogen for nitrogen the decomposition was much accelerated, but with the production of benzene and methane and smaller quantities of solids. The formation of stilbene, which occurs with the liberation of hydrogen, is inhibited. Methane and benzene react in the reverse direction to form toluene, but only very slowly. Thus hydrogen protects benzene from decomposition, whereas it decomposes toluene, but in the sense of breaking off the side chain while hindering molecular condensations with elimination of hydrogen, which are a characteristic effect of heat on the lower aromatic hydrocarbons. The xylenes resemble toluene in behaviour, while cresol is reduced by hydrogen at 750° C. to toluene, and necessarily to benzene also. The importance of atmosphere

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[1] Abstract of the William Young Memorial Lecture of the North British Association of Gas Managers, Glasgow, September 6, 1918, by Prof. John W. Cobb.

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